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THE BEET LEAFHOPPER IN RELATION TO THE PRODUCTION OF
GARDEN BEET SEED IN CENTRAL CALIFORNIA

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Garden beets have been grown for seed production in the Sacramento Valley of central California for many years. The seed is sown thickly in root beds in August and September, to produce from 25 to 100 plants per linear foot of row. No thinning is done in the fall, but in December all the roots are removed from the beds and carefully inspected, and undesirable plants are discarded. Plants chosen for seed production are then set out in large fields, being placed singly about 2 to 3 feet apart in rows which are about the same distance apart. The tall seed stalks develop during the spring months, and the seed crop is harvested in the summer. This method of seed growing enables the seed companies to select the roots rather carefully and also to produce the roots for a large final acreage in relatively small beds. The total area devoted to root beds in central California is probably less than 1,000 acres.

During the past 10 years the root beds have been subject to severe damage by curly top, a virus disease carried only by the beet of leafhopper (Eutettix tenellus (Bak.)). The primary source of the leafhoppers causing this damage is the large acreage of sugar beets grown in the Sacramento Valley, which serves as a summer host to these insects. The fall brood, produced on sugar beets and to a limited extent on weed hosts, drifts southward through the Valley during September and October, infesting the garden beet root beds, and often severely infecting them with curly top. The fields in which the roots are transplanted are practically free from leafhoppers during the winter months, and no further infection occurs until the leafhoppers begin their spring movements the following May. By this time the beets are so nearly mature that infection has but little effect upon the seed crop.

From the foregoing discussion it may be seen that garden beets grown for seed are subject to damage from curly top chiefly during the fall months while they are in the root beds. The protection of this crop against curly top depends upon controlling the leafhoppers in the root beds or upon choosing locations for the root beds in areas where few leafhoppers appear in September and October.

NATURE OF INJURY

Symptoms of curly top disease in the garden beet are similar to those in the sugar beet. They have been described by Severin (3) as transparent venation, leaf curling, protuberances on leaves, increased number of side rootlets, and others. These typical symptoms develop on beets planted in late summer if they are infected during August, September, or early October. Plants infected later than this rarely show any typical symptoms.

At sorting time the beet roots obviously infected are discarded, but those roots infected too late to show typical symptoms of the disease cannot be detected and discarded. Roots that are diseased do not produce normal seed stalks the following season. Since the roots are replanted singly with wide spacing, the effect of fall infection on the seed yield is nearly proportional to the number of roots that contain dormant or undetected disease at the time of transplanting.

HABITS OF THE BEET LEAFHOPPER

In central California the beet leafhopper overwinters in the eastern edge of the foothills of the Coast Range from Tracy south to the Tehachapi Mountains, and around the southern end of the San Joaquin Valley to the Sierra Nevada foothills, often extending as far north as Porterville. Migrations of spring adults from this area cover the entire northern part of the State. During the summer three broods of leafhoppers are produced upon cultivated host plants such as sugar beets, garden beets, and spinach, and upon certain weed hosts. In the Sacramento and Salinas Valleys the weed hosts are scarce, and sugar beets serve as the principal host. In the coastal areas all host plants are scarce except truck crops in restricted areas. The leafhoppers move from summer hosts back to the foothills in the fall. The life history and habits of the beet leafhopper in California have been recorded by Severin (4) and Cook (1).

Since most of the curly top damage to beet roots occurs during the fall months, the most severe damage may be expected in areas through which fall movements of leafhoppers are heavy.

INEFFECTIVENESS OF DIRECT CONTROL MEASURES

No direct measures have been found to control the beet leafhopper on garden beets grown for seed in central California. Romney (2) reported that the application of a pyrethrum-in-oil spray increased yields of seed on sugar beets and garden beets in Arizona, New Mexico, and western Texas. However, in these areas the beets are sown thickly in large fields, and are not transplanted. A pyrethrum-in-oil spray was tried on seed beds in central California, but did not prove successful. Although over 90 percent of the leafhoppers were killed, a single spraying of the beds did not reduce the infection sufficiently to be practical. More or less continuous shifting of the leafhopper population often reinfested beds shortly after spraying.

Trap crops of turnips and radishes planted between the beet rows have been tried to detract the leafhoppers from the beets, but without success. The use of various possible repellents, both chemical and mechanical, has also been without avail.

LOCATION OF ROOT BEDS IN DISEASE-FREE AREAS

Since no direct measures have been found to give satisfactory control of the beet leafhopper in the garden beet root beds, the problem has been solved temporarily by locating root beds in areas that are relatively free from leafhoppers during the fall. For several years surveys have been made during the late summer and fall to determine the areas that seemed to contain small fall populations. These surveys have been supplemented at times

by experimental plantings by the seed companies. As a result of this work it is possible to list and map certain areas where at the present time plantings of garden beets for seed are relatively safe from curly top damage in the fall. Some of these areas have been tried and found to be satisfactory, while others are given as possible areas for future plantings. In the areas shown on the map (fig. 1) beet roots will be relatively free from curly top infection, but their production may be undesirable for other reasons. At present no recommendations are made regarding conditions other than those affecting the beet leafhopper and curly top.

Certain precautions should be taken even in areas where very few leafhoppers are present. Fields selected for seed beet plantings should be away from large areas of host plants, either weed hosts such as mustards, *Atriplex* spp., and Russian-thistle, or cultivated hosts such as sugar beets, garden beets, spinach, or turnips. The leafhoppers from such fields, even though present in small numbers, may cause considerable damage to the relatively small root beds. A situation of this nature occurred at Clear Lake. Garden beet root beds were satisfactory for a few years, but later beets for canning were planted in the spring and summer, and the increased leafhopper population on these plants shifted to the root beds in the fall.

In case root beds are desired in the same general area where host plants are known to be present, it is advisable to locate the root beds on the windward side of the host plants. This precaution is sometimes sufficient practically to eliminate curly top damage in areas where prevailing winds are persistent.

The coastal areas (fig. 1, A) are relatively free of leafhoppers. Very few enter in the spring, and the climate is unfavorable for their development during the summer. Small valleys 10 or 20 miles back from the coast may have different conditions. In such areas it is important that the root beds be on the windward side of any beet fields or weed host areas. Beet roots have been grown to only a limited extent in one of the three areas shown on the map. Conditions other than curly top may limit their production elsewhere on the coast.

The Coast Range section north of San Francisco Bay (fig. 1, B) has been found relatively free of leafhoppers during the fall months. In parts of this section, particularly around Healdsburg and Santa Rosa, plantings have been made for several years and are proving satisfactory. In the southeastern portion of this area, around Suisun Bay and as far inland as Vacaville on the north and Brentwood on the south, few leafhoppers overwinter at present, and summer hosts are scarce. This area is out of the main path of both their spring and fall movements, and it remains relatively free from leafhoppers during the summer and fall. However, some overwintering and spring breeding occurred in the hills back of Brentwood during the dry years from 1930 to 1935, and it might occur again. It is also possible that a very heavy movement in the spring may be deflected from its normal course by unusual wind currents, and establish summer populations on one or both sides of Suisun Bay. For this reason it may be desirable to consult the Modesto laboratory of the Bureau of Entomology and Plant Quarantine before establishing new root beds in dry years.

A limited amount of survey work has been done in the Sierra foothills in the Sacramento Valley (fig. 1, C), and beet leafhopper populations have always been low. This may be due to the scarcity of summer host plants, and also of green plants that might hold leafhoppers during the fall movement. This foothill area would seem to merit experimental plantings, if suitable land can be found. Such plantings should be above the lowest range of hills, to be out of the line of the general fall leafhopper movements.

One field of garden beet seed that is practically free from curly top injury has been found in the Sacramento Valley. Since 1933 this field, situated about 2 miles west of Sacramento, has produced beet roots that are practically free of disease, while those in other seed beet fields nearby have been a complete loss. In 1941 no leafhoppers were found in this field, and only 2 diseased beets were seen, while a field of spinach 1 mile east had 50 leafhoppers per 100 feet of row, and 70 percent of the plants showed curly top infection. The reasons for this great difference in injury are not known, and other safe locations for planting beets for seed in the Sacramento Valley can be determined only by experimental plantings.

LITERATURE CITED

- (1) Cook, W. C.
1941. The beet leafhopper. U. S. Dept. Agr. Farmers' Bul. 1886, 22 pp., illus.
- (2) Romney, V. E.
1942. The beet leafhopper and its control on beets grown for seed in Arizona and New Mexico. U. S. Bur. Ent. and Plant Quar. E-567, 10 pp., illus. [Processed.]
- (3) Severin, H. H. P.
1929. Curly top symptoms on the sugar beet. Calif. Agr. Expt. Sta. Bul. 465, 35 pp., illus.
- (4) _____
1930. Life-history of beet leafhopper, Eutettix tenellus (Baker) in California. Calif. Univ. Pubs., Ent. 5: 37-88, illus.

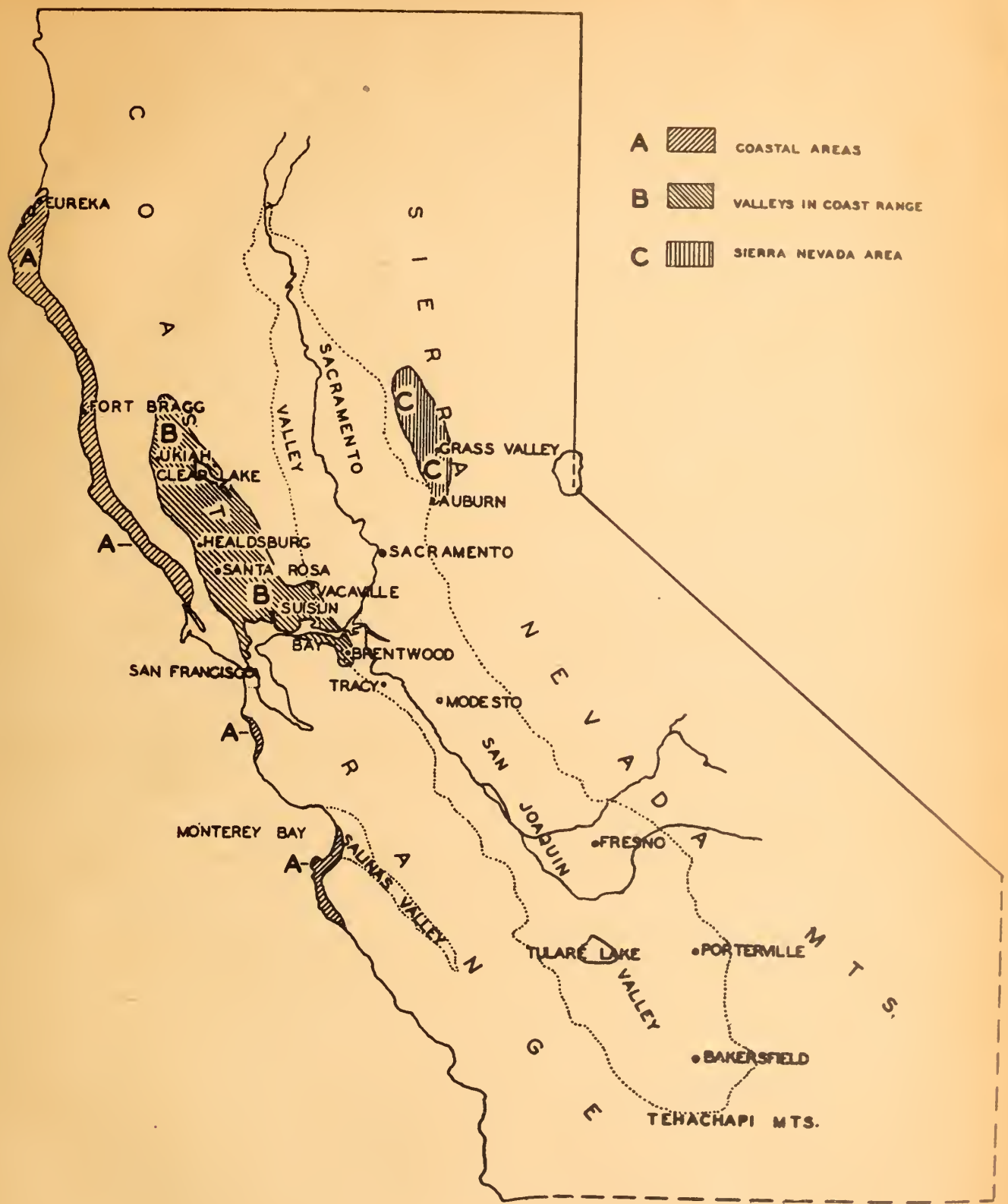


Figure 1.--Areas in central California which are safe for the production of garden beet roots.

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